WEST VIRGINIA STATE UNIVERSITY

1891

Find Your Passion.

Academic Affairs Assessment of Student Learning
Report for Academic Year 2018-2019

Department/Program: Mathematics
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1. **Which learning outcomes did you measure this past year?** The mathematics program measured all of its learning outcomes this year as planned. Outcomes 1-4 and 7 (initial measurement) were measured in multiple sections, outcomes 1-4 (second measurement) were measured in multiple sections, and outcomes 1-5, 7, 8 (final measurement) were measured in one section of a senior level course, though no data was reported regarding PLOs 5 or 7.

2. **In which course(s) were assessments conducted?**
   Outcomes were measured in Math 206 (initial measurement), Math 208 (second measurement) and Math 408 (capstone course).

3. **How did you assess the selected program learning outcomes?** Outcomes 1-4, 7 and 8 were measured using standard departmental exams combined with item analysis. Outcomes 5-8 were measured using student presentations as judged by the faculty.

4. **How many students were included in the assessment(s) of each PLO in a course?**
   For the initial measurement of PLOs 1-4 and 7, fifteen students were included. For the second measurement (PLOs 1-4), three students took the test. For the final measurement of PLOs 1-4, 8, five students were included.

5. **How were students selected to participate in the assessment of each outcome?**
   For the first and second measurements, all students who were present the day the test was given were included. For the final measurement, all students in the class were included.

6. **In general, describe how each assessment tool (measure) was constructed** (i.e. in-house, national, adapted).

All instruments were constructed in-house.

7. Who analyzed results and how were they analyzed

The data was run through two computer programs to generate a score for each PLO and an item analysis of the test results. These were then discussed by the department's assessment committee with an eye towards whether PLO scores improve from measurement to measurement.

8. **Provide a summary of the results/conclusions from the assessment of each measured Program Learning Outcome.**

Data:

Test 1:

	Inchoate	Emerging	Developed	Mastered
PLO 1	5	6	4	0
PLO 2	6	6	3	0
PLO 3	7	7	1	0
PLO 4	4	7	4	0
PLO 7	2	4	6	3

Test 2:

	Inchoate	Emerging	Developed	Mastered
PLO 1	1	2	0	0
PLO 2	0	3	0	0
PLO 3	1	0	2	0
PLO 4	1	1	1	0

Test 3:

	Inchoate	Emerging	Developed	Mastered
PLO 1	0	5	0	0
PLO 2	0	2	2	1
PLO 3	1	1	3	0
PLO 4	0	2	3	0
PLO 8	0	2	0	3

PLO 1 seems to follow a u-shaped pattern, with Test 1 showing students as Emerging/Developed, Test 2 showing students as Inchoate/Emerging and Test 3 showing students as Emerging. The reason for the regression on Test 2 is unclear. It could be the exam is significantly more difficult than Test 1 or it could indicate a lack of retention, though it had a very small sample size in 2018-2019. It should be noted that the data for Test 3 has only a small sample size.
PLO 7 had no meaningful data due to an inadequate assessment method. This will need to be worked on.

9. **What are next steps?** (e.g., will you measure this same learning outcome again? Will you change some feature of the classroom experience and measure its impact? Will you try a new tool? Are you satisfied?)

The above outcomes will continue to be measured every year. The department decided to combine PLOs 5 and 8 (which both refer to working with data) into one PLO. A new instrument to directly measure PLO 7 is being created.

10. **Please attach an example of the assessment tool used to measure your PLO(s).** These can be added as an appendix, a link to the assessment, or sent separately in email with your report.

Assessment Exam - Math 206

1. If $f(x) = 9x^2 - 5$, evaluate $\dfrac{f(x+h) - f(x)}{h}$

   (a) $9h^2 - 5$

   (b) $18x + 9h$

   (c) $9h - \dfrac{5}{h}$

   (d) $18xh + 9h^2$

2. Which of the following points is not in the interior of the circle $x^2 + y^2 - 4x + 6y = 0$?

   (a) $(5, -2)$

   (b) $(0, -3)$

   (c) $(-1, 0)$

   (d) $(3, -5)$

3. A chemical element has a half-life of 21 days. If you have 12 grams left after 10 days, how much did you start with?

   (a) 8.6 grams

   (b) 12 grams

   (c) 16.7 grams

   (d) 21 grams

4. If $\sin\alpha = \dfrac{2}{5}$ and $\cos\alpha < 0$ find the value of $\cot\alpha$

   (a) $3/5$

   (b) $-3/2$

   (c) $-2\sqrt{21}/21$

   (d) $-\sqrt{21}/2$

5. In the interval $[-\pi/4, 11\pi/4]$, how many times does the graph of $y = 4\sin 3x$ crosses the x-axis?

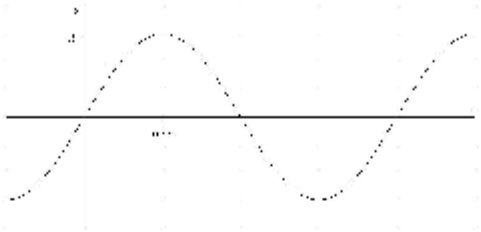
   (a) 0

   (b) 5

   (c) 9

   (d) 11

6. Which of the following functions is best represented by the given graph?



(a) $y = 3\sin(2x - \frac{\pi}{4})$

(b) $y = 2\sin(3x)$

(c) $y = 3\sin(2x)$

(d) $y = 3\sin(2\pi x)$

7. A new water pipeline was to replace one that had been installed years earlier. Since the terrain was rocky, the old line ran due west for 650 feet then turned 60° to the north for another 750 feet. It was decided to cut through the rocks with modern equipment and replace the old line with a straight one. How much pipe (to the nearest foot) is needed to lay a straight pipeline?

(a) 4975 feet

(b) 1213 feet

(c) 1352 feet

(d) 375 feet

8. Evaluate $\lim_{x \to 7} \frac{\sqrt{x+9} - 4}{x - 7}$

(a) 0

(b) 1/8

(c) 1

(d) ∞

9. For which value of k will $f(x) = \begin{cases} kx + 3 & \text{if } x < 1 \\ k^2x^2 + 1 & \text{if } x \geq 1 \end{cases}$ be continuous at $x = 1$?

(a) 2

(b) -2

(c) 1

(d) 3

10. Consider the implicitly-defined curve $x^2 + 3y^3 = x - 1$. What is the y-intercept of the tangent line to this curve at the point $(2, -1)$?

    (a) $(0, -1)$
    (b) $(0, 2)$
    (c) $(0, -\frac{1}{3})$
    (d) $(0, \frac{2}{3})$

11. Find the slope-intercept form of the equation of the tangent line to the graph of $x^2y^2 + 6x - 3 = 0$ at $(-1, 3)$

    (a) $y = 2x + 5$
    (b) $y = \frac{1}{2}x + \frac{7}{2}$
    (c) $y = 4x + 7$
    (d) $y = 2x - 5$

12. An open box is to be made from a 3-foot by 5-foot rectangular piece of material by cutting equal squares from each corner and turning up the sides. Find the volume of the largest box that can be made in this manner.

    (a) 5.2 cubic feet
    (b) 4.1 cubic feet
    (c) 7.5 cubic feet
    (d) 3.3 cubic feet

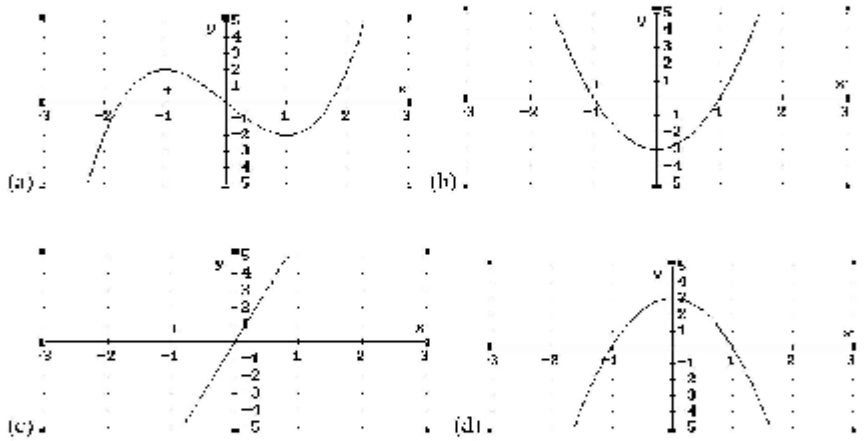
13. Let $f(3) = 0$, $f'(3) = 6$, $g(3) = 1$, and $g'(3) = \frac{1}{3}$. Find $h'(3)$ if $h(x) = \frac{f(x)}{g(x)}$

    (a) 18
    (b) 6
    (c) -6
    (d) -2

14. Let $f(x)$ be a polynomial function such that $f(4) = -1$, $f'(4) = 2$, $f''(4) = 0$. If $x < 4$, then $f''(x) < 0$ and if $x > 4$, then $f''(x) > 0$. The point $(4, -1)$ is a(n) ———- of the graph.

    (a) intercept
    (b) relative maximum
    (c) relative minimum
    (d) point of inflection

15. The graph of $f'(x)$ is given. Which of the following graphs represents the graph of $f(x)$?



16. A ladder 25 feet long is leaning against the wall of a house. The base of the ladder is pulled away from the wall at a rate of 2 feet per second. How fast is the top of the ladder moving down the wall when the base is 7 feet from the wall?

(a) 24 feet per second

(b) 14 feet per second

(c) $\frac{7}{24}$ feet per second

(d) $\frac{7}{12}$ feet per second

17. Find the area of the region bounded by $y = (x-1)^2 + 1$, the $x-$axis, $x = 2$, and $x = -1$.

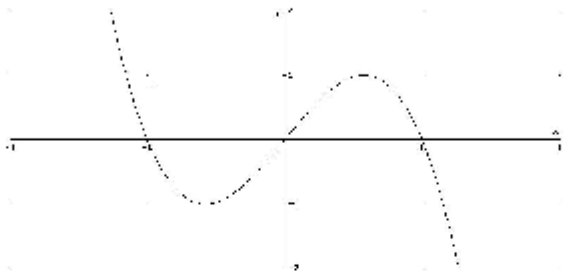
(a) 6

(b) 7

(c) -6

(d) $\frac{9}{2}$

18. The graph of $f(x)$ is given. Evaluate $\int_{-1}^{1} f(x)\,dx$



(a) 2

(b) 0

(c) 1

(d) π

19. To integrate $\int x^2\sqrt[3]{x^3-4}\,dx$ using substitution, which of the following substitutions should be used?

(a) $u = \sqrt[3]{x^3-4}$

(b) $u = x^2$

(c) $u = x^3 - 4$

(d) $x = \sqrt[3]{x}$

20. A 24 cm long wire is cut into two pieces, each of which is bent into a circular shape. If the ratio of the area of the circular regions is 4 to 1, what was the length of the shorter piece of wire?

(a) 4 cm

(b) 6 cm

(c) 8 cm

(d) 10 cm