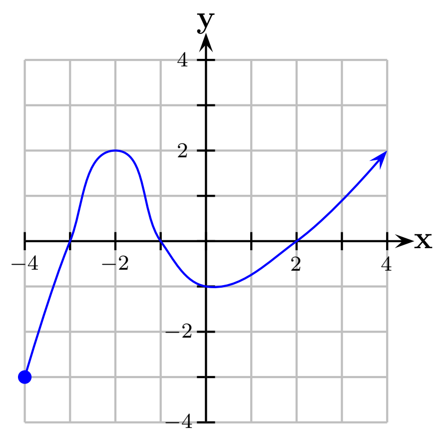
Math 30, Practice Final Exam

This practice final is to give you an idea of what to expect and help us review. On the final you will be asked to do all the questions in 2 hours and 50 minutes. They are worth 5 points each (Q11, Q18 are worth 10 points each), and to get these points you must show clearly all your working out and reasoning. You may use a scientific calculator. Phones must be put away. Use the restroom before the exam, not during it.

---

(1) *[Sections 1.1, 1.2, 1.3]* For this graph of the function $f(x)$,



answer these questions, using interval notation for parts (c), (d):

(a) Evaluate $f(3)$ and $f(-2)$

(b) Find all of its x and y-intercepts

(c) Give its domain (an arrow means the graph goes forever in that direction)

(d) Give its range (shadow on the y axis)

(2) *[Sections 1.1, 1.2, 1.3]* Further questions about the same graph:

(a) Where is it positive? (Give the xs where the graph is above the x axis in interval notation.)

(b) Where is it increasing? (Give the xs where it's increasing.)

(c) Where is it decreasing? (Give the xs where it's decreasing.)

(d) Give the coordinates of any local maximums or minimums.

(e) Is f a one-to-one function?

(3) *[Section 1.4]*

For the functions $f(x) = x^2 - 5x + 2$ and $g(x) = 4x - 1$, compute and simplify

(a) $f(g(x))$

(b) $g(f(-1))$

(4) *[Sections 1.2, 1.7]*

(a) Give the domain of $f(x) = \dfrac{x^2+1}{\sqrt{x+1}}$ in interval notation.

(b) Find $g^{-1}(8)$ if $g(8) = -6$ and $g(-3) = 8$.

(5) *[Section 1.6]* Solve the inequality $|3x - 6| + 1 > 4$ and give the answer in interval notation.

(6) *[Section 1.7]* Find the inverse of the function $h(x) = \dfrac{2x+1}{3x-5}$

(7) *[Sections 2.1, 2.2]* Let l_1 be the line through the points $(-1, 2)$ and $(3, -1)$. Find an equation for the line l_2 that passes through the point $(2, 1)$ and is perpendicular to l_1.

(8) *[Section 3.2]* Let $f(x) = -x^2 + 2x + 3$. Find the vertex and the x and y intercepts. Use this to carefully sketch the graph of $f(x)$.

(9) *[Sections 3.3, 3.4]* Carefully sketch the graph of $h(x) = -2(x+3)^2(x-4)$ after finding its end behavior, intercepts and multiplicities of zeros.

(10) *[Sections 3.5, 3.6]* Let

$$g(x) = 2x^3 + 7x^2 - 9.$$

List all possible rational zeros of $g(x)$ according to the Rational Zeros Theorem. Then find all of the actual zeros.

(11) *[10 points, Section 3.7]* Find the x and y intercepts and all vertical and horizontal asymptotes of the graph of the rational function

$$g(x) = \frac{2(x+2)(x+4)}{(x+1)(x-2)}.$$

Sketch the graph using this information and by plotting some extra points if necessary.

(12) *[Sections 4.3, 4.5]* Find the exact value of: $\log_2\left(\dfrac{16}{\sqrt{2}}\right)$

(13) *[Sections 1.5, 4.4]* Graph the function $y = 1 + \log_3(x+3)$ showing all intercepts and asymptotes.

(14) *[Sections 4.5, 5.2, 6.3]*

(a) Express $\log_3 1000$ using the common logarithm (base 10). Then use your calculator to evaluate it correct to 4 decimal places.

(b) Find $\cos(5\pi/6)$ exactly.

(c) Find $\sin^{-1}(-\sqrt{3}/2)$ exactly.

(15) *[Section 4.6]* Solve the equation: $3e^{2x} - 5 = 22$.

Give an exact answer and also a decimal answer that is correct to 4 places.

(16) *[Section 4.6]* Solve the equation: $\log_4 x + \log_4(x+12) = 3$

(17) *[Section 5.2]* If $\cos t = -2/9$ and t has terminal side in the second quadrant, then find $\tan t$ exactly.

(18) *[10 points - Section 6.1]* Determine the amplitude, period and phase shift of

$$y = -3\sin(2x - \pi/2)$$

Then graph at least one period of this function carefully. Mark off the numbers you need on the x and y axes.

(19) *[Sections 7.1, 7.2]*

Verify the trigonometric identity:

$$\frac{\sec\theta}{\csc\theta(1+\sec\theta)} + \frac{\csc\theta(1-\sec\theta)}{\sec\theta} = 0$$

(20) *[Section 7.5]* Solve: $1 + \sqrt{2}\cos x = 0$ for x in $[0, 2\pi)$
